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**GLOBAL IMPACT OF THE ANTARCTIC OZONE HOLE:  
SIMULATIONS WITH A 3-D CHEMICAL TRANSPORT MODEL**

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A study of the Antarctic ozone hole has been made with a 3-D chemical transport model using linearized photochemistry for ozone based on observed distributions. The tracer model uses the winds and convection from the GISS general circulation model ( $8^\circ \times 10^\circ \times 23$  layers). A 3-year control run of the ozone distribution is compared with the observed climatology. In two experiments, a hypothetical Antarctic ozone "hole" is induced on October 1 and on November 1; the tracer model is integrated for 1 year with the standard, linearized chemistry. The initial depletion, 90% of the  $O_3$  poleward of  $70^\circ S$  between 25 and 180 mbar, amounts to about 5% of the total  $O_3$  in the Southern Hemisphere. As the vortex breaks down and the "hole" is dispersed, significant depletions to column ozone, of order 10 D.U., occur as far north as  $36^\circ S$  during Austral summer. One year later, about 25% of the original depletion remains, mostly below 100 mbar and poleward of  $30^\circ S$ . Details of the calculations will be shown, along with a budget analysis showing the fraction of the "hole" filled in by photochemistry versus that transported into the troposphere.

Table. Dobson Map of the Dispersion of an Antarctic Ozone Hole:  
Initialized November 1

(Units are negative D.U. relative to control climatology)

| lat. | Nov1 | Dec1 | Jan1 | Feb1 | Mar1 | Apr1 | May1 | Jun1 | Jul1 | Aug1 | Sep1 | Oct1 | Nov1 |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 4S   | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| 12S  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| 20S  | 0    | 0    | 0    | 1    | 1    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| 28S  | 0    | 0    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    |
| 36S  | 0    | 1    | 4    | 6    | 6    | 7    | 6    | 7    | 6    | 6    | 5    | 5    | 4    |
| 44S  | 0    | 7    | 11   | 11   | 11   | 11   | 10   | 10   | 9    | 8    | 7    | 6    | 5    |
| 52S  | 0    | 17   | 20   | 16   | 16   | 14   | 14   | 12   | 10   | 9    | 8    | 7    | 6    |
| 60S  | 0    | 31   | 26   | 22   | 19   | 17   | 16   | 13   | 12   | 9    | 9    | 7    | 6    |
| 68S  | 0    | 46   | 29   | 27   | 21   | 20   | 18   | 16   | 13   | 12   | 10   | 8    | 7    |
| 76S  | 242  | 59   | 33   | 28   | 22   | 20   | 19   | 17   | 15   | 13   | 11   | 9    | 7    |
| 84S  | 235  | 109  | 60   | 33   | 29   | 25   | 19   | 18   | 16   | 15   | 12   | 10   | 7    |
| 90S  | 212  | 160  | 88   | 42   | 33   | 29   | 14   | 15   | 18   | 16   | 11   | 9    | 7    |